THE CHINESE ARE COMING – AN ANALYSIS OF THE PREFERENCES OF CHINESE HOLIDAY MAKERS AT HOME AND ABROAD

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Abstract

We analyse the destination choice of Chinese tourists in China and abroad. Abroad, Chinese tourists prefer to travel to large and rich countries, and are little deterred by distance. Climate, coast, culture and political stability are irrelevant. Chinese tourists travel disproportionally to "approved destinations", but this is being eroded as more countries acquire this status. The model predicts that Southeast Asian countries are harmed most by the extension of the ADS system, while North America suffers most from being excluded. Domestically, Chinese tourists prefer rich and densely population areas, but dislike cities. They value easy access by road and rail, and are attracted by nature. Cultural attractions are less important, and may even reduce tourist numbers. Although potential tourist numbers are large, tourist operators should not assume that Chinese tourists behave like other tourists.

Key words

International tourism, domestic tourism, China, destination choice

1. Introduction

In 15 years time, the top 10% of Chinese earners could have the same average income as Western Europe enjoys today. They may adopt a similar lifestyle. They may be as keen to travel as are people from Germany, Italy or Taiwan. They are 100 million people strong, and the second decile would soon reach the same income levels. China may become a major factor in international tourism (CNTA 2003; FAZ 2003; HA 2005; Economist, 2006). 80 Mio Chinese already have the financial means to spend over 2000 Euro on a holiday (FAZ 2003). Where will they go? Will they choose a once-in-a-lifetime-trip to Europe and spend the rest of their holidays in China? This paper studies the behaviour of Chinese holiday makers in the recent past and predicts their behaviour in the near future.

Projections by Zhang and Lew (2003) show that the People's Republic of China (China) could become the fourth world tourist generating country by 2020 with a market share of 6.2%. Under this prospect, many countries seek the Approved Destination Status (ADS) that they need to welcome Chinese travellers in package tours (CNTA 2003). In March 2006, 81 countries have received this status (CNTA 2006; see Table A5).[1] Germany gained the status only in 2003 and accordingly for the period of 1994-2004 the number of visits (per night) for China showed an increase of 171% (DZT 2005). This leads to expectations for many more Chinese visitors to come, some of them are misleading as they imply that most Chinese already travelled through most of their own country (Hoffmann 2005), which is not the case.

The ADS-system applies for package tours. There are diverse interpretations on the importance of package tours in the future. Ryan (2003) mentions a general trend towards self-catering holidays away from the package tours variety. In contrast to Japanese travellers that took 20 years to generate an independent travel style, Chinese outbound tourists already constitute of a significant number of independent travellers (World Economic Forum, 2003). This opinion contradicts some other studies that emphasise the Chinese/Asian preference for group package tours (Tisdell and Wen 1991; Zhang 1997). It is the ADS-system that organizes most Chinese outbound tourism in package tours; this system is unlikely to change in the near future. But it may be a reason especially for younger Chinese to prefer independent travel, as far as governmental visa- and passport-regulations allow. The self-help network Yiqilai that emphasises the wish for freedom to choose a travel itinerary also indicates this. On their web site, they mention a growing opposition against forced shopping stops within organised tours.[2]

Zhang and Lew (2003) expect the revenue of domestic tourism to grow by 6.6-9.4 times between 2000 and 2020, an annual rate of 10-12%. During the last 20 years, domestic tourism development was less rapid. This was due to different reasons. Domestic tourism development was first subordinated to the increase of foreign tourism; and gained speed only after 1989. To support domestic tourism, in 2003, the market opened to foreign investors that were now allowed to run travel agencies in China (People's Daily 2003). Projections expect 210-300 million inbound tourist arrivals by 2020, of which foreigners[3] will make up 31-45 million (Zhang and Lew 2003).

A number of official website presentations (CNTA, CNTO Toronto 2004) further explain the Chinese tourism policy. China was practically closed to foreign tourism until the economic reforms and open-door policy started by Deng Xiaoping in 1978. Domestic travel had also been subject to strict limitation, through a permit system for accommodation and transportation tickets (Sofield and Li 1998). As a means of generating foreign investment and gain foreign currency revenue (see Jenkins and Henry 1982) foreign tourism was then actively supported by the Chinese government, e.g. with successively opening tourist cities to foreigners[4] (Richter 1983), and generally in privileging foreigners through advanced booking conditions and provision of high-

[1] For information on the order of approved countries and official guidelines refer to Kim *et al.* (2005). Verhelst (2003) discusses ADS in relation to the Shengen area.

[2] In China it is usual that a relatively short leisure bus trip is interrupted by several stops for food and shopping opportunities. As these routes to tourist attractions are also taken by regular bus services tourists who want to prevent this are left to take a taxi instead; an option that is not affordable to the average domestic tourist.

[3] People from Hong Kong, Macau, and Taiwan are inbound tourists, but not foreigners.

[4] During Mao's time only a dozen tourist cities were open to foreigners, 1979 this number had increased to 60 and 1982 it were over 100 (Richter 1983).

quality accommodations[5] and special shopping opportunities (Zhang 1997). Despite some organisational problems the trend was steady until the breakdown of the democracy movement in 1989, which lead to a decrease of growth rate by 17.2% (cf. Hall 1994, Table 4.1). This was a turning point in tourism policy as now domestic tourism became the focus instead of foreign tourism.

The development of domestic tourism was further stimulated by the pay rise act of 1993, the 5-day-week, and the increase of holidays to three 'golden' weeks a year (Xiao 1997; Zhang 1997; Zhang and Lam 1999; Zhang and Lew 2003; CNTO Toronto 2004). Despite some remaining restrictions, the 1990s saw an opening of the country and Chinese were allowed to travel to a growing number of destinations that were not necessarily politically-favoured by the government. The regulation system behind this is that of the Approved Destination Status.

The proportion of individual travellers to China has risen (Wen *et al.*, 2003), as has the share of tourists visiting relatives and friends. In fact, the share of Overseas Chinese has risen. Eco-tourism and cultural tourism are rising as well, but the former is still small while the latter tourism suffers from a lack of authenticity and from sinisisation of minority cultures in theme parks. In their Chinese manifestation, both tourism themes are less attractive to Western tourists.

This study is based on a regression analysis of openly accessible data of tourism flows from the People's Republic of China (China) and in the country, both domestic and inbound international tourism, respectively. In addition, we look at the international travel behaviour of the Han from Hong Kong, Singapore and Taiwan. As we do not have access to data directly reflecting the tourists' needs and behaviour from their own subjective perspective, we focus on actual behaviour and interpret the tourists' preferences. This paper continues the style of statistical analyses found in Lise and Tol (2002) and Bigano *et al.* (2006).

The regression results are complemented with the results from studies that have China as a focus – either as a destination country for foreign tourism or as a tourist generating country for outbound tourism. The former group is represented by works of Tisdell and Wen (1991, Wen and Tisdell 2001) and Wen *et al.* (2003). The preferences of Chinese outbound tourists are discussed by Kim *et al.* (2005) and Zhang and Lam (1999). We further take studies on domestic Chinese tourism as a basis (Schwickert 1989, Zhang 1997) specifically on recent historic development (Richter 1983), the interaction of cultural policy with tourism policy (Sofield and Li 1998) and the economic dimension (Zhang and Lew 2003; Xu 1999). Ghimire and Li (2001) discuss the relation of tourism development with poverty eradication programs, whereas Zhang *et al.* (1999) have the most comprehensive account on tourism policy development in China. Chu (1994) focuses on sightseeing areas and Chen *et al.* (2004) on the recreational benefit of beaches. The preferences of foreign to domestic tourists are subject by Xiao (1997) and Cheung (1999). Reisinger and Turner (2002a,b) and Enright and Newton (2005) show the differences between Chinese tourists and other Asians.

The paper is set-up as follows. Section 2 presents the data, and descriptive statistics. Section 3 shows regression results. Section 4 concludes.

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[5] Interestingly, Tisdell and Wen (1991) cite a study by Zhao Jian, who claims that 70% of all foreign visitors interviewed wanted middle or lower class hotels instead of high-class hotels that were primarily provided.

[6] For information on the order of approved countries and official guidelines refer to Kim *et al.* (2005). Verhelst (2003) discusses ADS in relation to the Shengen area.

2. The data

2.1. Set-up and sources

International tourism data are taken from WTO (2003a). Where available, we use their Table 1 'international arrivals of *tourists* by *country of residence'*. If not available, we use the alternative Table 1 'international arrivals of tourists by *nationality'*. If no Table 1 is there, we instead use Table 4 'international arrivals of tourists in *all establishments'*. In the current study, no distinction is made between residence and nationality. If there is no Table 4 either, we use Table 3 'international arrivals of tourists in *hotels'*. Note that we thus exclude business travellers, but mix up travellers on holiday, pilgrimage, and family visits. WTO (2003a) reports annual arrivals numbers for 1997-2001. We use the average of these five years, smoothing out annual variability.

The volume of domestic tourist flows is derived using 1997 data contained in the Euromonitor (2002) database. Foreign tourism numbers in China fell during the SARS crisis of 2003; this made government subsidies to the tourism industry necessary (Au *et al.*, 2005; People's Daily 2006). In order to avoid distortion of results due to SARS our regression analysis is based on 2002 data.

Provincial-level data on the numbers of tourist arrivals were taken from the China Statistical Yearbook 2002 (CNBS 2003) and if not clearly stated they were re-calculated through information of the yearbooks 2001 and 2003 (CNBS).

For compilation of tourist spots we collected tourist spots from 6 sources on a national basis (Chinese and foreign origin as well as in Chinese and English language) and an additional 46 local Chinese sources (all in Chinese language). All sources are freely accessible websites, except the two foreign sources for which we used the paperback print versions. For details on the compilation of our database, see Appendix 1. The data break down to the county level. For the statistical regression analysis we use province data though, as there are no county data on tourist arrival numbers for China. In the following we distinguish between tourist spots (tourist attractions derived from our own database), tourist sights (attractions listed by the sources we used), and tourist sites (UNESCO's world heritage sites). Generally, tourist spots are classified into natural (N), cultural (C), natural and cultural (CN), and other (O) including all spots that cannot be exclusively associated with culture or nature. An additional classification (OM) is a mix of O with either C or N.

For general source comparison we used the information provided by the China National Tourism Administration (CNTA), Yiqilai (a Chinese non-commercial self-help travel network with expert support) that reflects the preferences Chinese tourists have, and the mainly commercial Travel-China-Guide.

2.2. Descriptive statistics: Countries

In 1991 a governmental policy allowed Chinese nationals to join overseas tours to selected countries. These were the first countries with an ADS status (Zhang *et al.* 1999). For outbound Chinese tourism, the ADS-system cannot be underestimated. Verhelst (2003) explains that the system has strong impacts on tourism related interests that the countries that apply for the ADS-status have, i.e. economic interests and

immigration restrictions. To the Chinese government it is a political control instrument that can also be used in negotiations with the Chinese government that do not seem to be related to tourism, e.g. human rights. The prospect of economic advantage in one field may influence decisions in another.

Table A6 shows the most popular destinations for tourists from China, Hong Kong, Taiwan, and Singapore; no data are available for Macau. For international tourists from China, Macau is the most popular destination, followed by Thailand, Japan, Malaysia, the USA and Germany. For completeness, we show the entire top 20, but visitor numbers rapidly tail off. Note that we do not know the number of visitors to Hong Kong (probably high), Taiwan (probably low) and Singapore. For tourists from Taiwan, Japan is the prime destination, followed by Thailand, the USA, Indonesia and Macau. For tourists from Hong Kong, Macau comes first, followed by Thailand, Taiwan, Japan, the USA, Canada and the Philippines. For tourists from Singapore, Malaysia is the number one destination, followed by Indonesia, Thailand, China, India, and the USA. This suggests that the people from China, Hong Kong, Taiwan and Singapore, like so many other tourists, prefer to spend their international holidays in the near abroad. Thailand has clearly established itself as a major destination.

Wen and Tisdell (2001) report 1.8 mln tourists visiting China in 1986. In 1997, this had risen to 7.4 mln, and further to 11.2 mln in 2001 (WTO, 2003b), an increase of 13% per year.[7] Table A6 shows the top 20 travellers to China. Japan comes first, followed by South Korea, Russia, the USA and a range of countries. In fact, tourism numbers exceed 100,000 for 14 countries, with India very close. Since 1998, especially visitor numbers from South Korea, Malaysia, Germany, Thailand and Indonesia increased (see Wen and Tisdell 2001). Again, we do not have data for Hong Kong, Macau, Singapore and Taiwan.

2.3. Descriptive statistics: Provinces

There has been only little research on domestic tourism in China, mostly on the grounds of insufficient data. Domestic tourism numbers given for specific regions, especially the economic zones that relate to major river deltas, are often overstated. For instance, it is claimed that over 25% of China's domestic tourism in 2001 went to the Yangtse River Delta (extended Shanghai region) while the Pearl River Delta (around Guangzhou) accounted only for 7% (Invest Hong Kong 2004). Table A7 shows tourism statistics per province for 2002 according to our database. As our data base does not break down to the county level, we estimate the proportion of regions included as half for Jiangsu and Zhejiang, and one-third for Guangdong. With 15% for the Yangtse River Delta[8] and 2.9% for the Pearl River Delta our results are well below the numbers stated above and indeed suggest an overvaluation of the delta regions' share in domestic tourism.[9]

Table A7 shows foreign tourist numbers for 1986 (Wen and Tisdell, 2001) and 2002 (Bigano *et al.*, 2004). Ten provinces have a decreasing share of the market, and 19 an increasing share. This implies that international tourists are spread more evenly over the country – although the spread is still very uneven, ranging from 15 mln in Guangdong

[7] Our data base of foreign visitors per province indicate 40.4 mln visitors in 2002; the discrepancy is surely due to tourists visiting more than one province.

[8] In the case of counting Zhejiang province in total our data show 19.6%. This difference is criticised by Invest Hong Kong (2004) as a major drawback in data consistency due to a lack of available local data in Zhejiang.

[9] All numbers refer to the official domestic tourism data of 2002 (877.8 mln).

to less than 10,000 in Ningxia. In addition, regional development through a wider dispersial of tourists among the regions (see Wen *et al.* 2003) is supported by the rise of international tourism numbers through Overseas Chinese travellers. Eco- and cultural tourism are major themes in regional tourism development.

Table 1 lists the initial 60 explanatory variables we compiled. These range from our newly compiled information on tourist spots and their classification to official source information on tourist sights ('must-sees') with comparable classification, and additional information by official sources regarding mountains and tourist cities. These variables are used to estimate the influence the actual existence of tourist attractions (tourist spots) has on tourism numbers in comparison to the attractions that are listed by official and commercial tourism providers (tourist sights). The 'mountain' variable regards the potential importance of holy mountains on domestic tourism numbers and the variable 'cities' is used to reflect if the strategy of appointing cities to tourist centres has an impact on tourism numbers. Other variables are on regional classifications, where we adopt the coastal/non-coastal distinction used by e.g. Wen and Tisdell (2001) and Wen *et al.* (2003) and add another along official grouping (N, NE, E, S, SW, NW). Figure 1 has a map that shows the distribution.

As Chu (1994) states, accessibility of sightseeing areas is a prerequisite and transportation plays a major role (compare also Xu 1999; Wen *et al.* 2003; Enright and Newton 2005). We therefore have information about transportation facilities, i.e. airport numbers, highway length and railway length. Since 1988 the national tourism commission focussed on civil aviation development, which showed in a close cooperation between the CNTA and CAAC (Zhang *et al.* 1999). Recently a number of airports were established in remote areas and smaller cities. This was supposedly to open these regions for economic and tourism reasons (Tisdell and Wen 1991 after Zhang 1989; World Economic Forum 2003 citing Ho Kwon Ping; People's Daily 2001). Apparently in 1987 the operation and management of airports was transferred to local and regional governments, a development that may have contributed to an overcapacity in some locations (compare Zhang *et al.* 1999). It is interesting to learn, if this strategy is likely to generate higher tourism numbers. Another group of variables is on climate, general physical conditions, population, economy and natural conditions.

The descriptive statistics for our tourist spots variable is presented in Table A8. C classification is clearly the highest score, closely followed by N classification. CN, O and OM classifications make less than 27% percent[10]. The time code categorisation shows that a lot of tourist spots were not included in this system, as they represented natural spots. The second largest score was reached by spots related to the imperial epoch. Third largest number, although only covering less than 10% altogether, was reached by spots related to the modern present time. This shows that surprisingly the number of spots from antiquity, although widely promoted are actually small in number, and also the spots related to Chinese Red Tourism[11] is actually quite small. Table A9 shows the descriptive statistics for all other variables. It is obvious that the focus of the compared sources for the distinction of C and N classification is quite different. Also the overall numbers of spots is diverse. Similar patterns are detectable for tourist cities and mountains. We discuss this matter further down.

[10] The total 1325 spots in our database split into 42.1% of C spots, followed by 31.2% of N spots, 13.9% of CN spots and 9.7% of O spots; 3.2% are OM spots.

[11] Red Tourism describes attractions related to the Socialist revolutionary era. It also resembles a type of tourism that is increasingly promoted by national and local tourism providers, for instance through according tour offers.

3. Regression analysis

3.1. International travel

We started with a regression that includes all potential explanatory variables for destination choice. We then one-by-one eliminated all those variables that were individually insignificant, also testing for joint significance. The following relationship for all four "countries" of origin (People's Republic of China, Hong Kong, Singapore, Taiwan) results:

$$\ln(A_i^j) = c^j + \delta_{dom} + \delta_{ADS} + \alpha_1^j (1 - I_{i=j}) \ln(D_i^j) + \alpha_2^j \ln(y_i) + \alpha_3^j T_i + \alpha_4^j T_i^2 + \alpha_5^j H_i + \alpha_6^j C_i + \alpha_7^j G_i + \alpha_8^j S_i \quad (1)$$

where A_i^i denotes the arrivals in country i from country j (WTO, 2003a); D_i^j is the great-circle distance between the capitals of the two countries (longitude and latitude are taken from the index-gazetteer of the Times Atlas, 1994); y_i is per capita income in the destination country (WRI, 2002); T_i is the annual average temperature in the destination country (New *et al.*, 1999); H_i is the number of world heritage sites per million square kilometers in the destination country (UNESCO, 2006); C_i is the length of the coast line of the destination country (CIA, 2004); G_i is the land area of the destination country (CIA, 2004); and S_i is an index of the political stability of the destination country (Kaufmann *et al.*, 1999); besides the constant c, we also estimate a dummy for whether the tourists stay in their home country ($i=j$), and a dummy for whether the country has ADS.[12]

Table 2 shows the results. Distance deters, but more so for tourists from Hong Kong and Singapore than for tourists from China and Taiwan. Poverty in the destination country deters too, and more so for tourists from Hong Kong and Taiwan than for tourists from China; surprisingly, tourists from Singapore do not care about poverty. Tourists from Taiwan and China do not care about the climate, but people from Hong Kong and Singapore do. The optimal holiday temperature for the Hong Kongese is 16.9°C but tourists from Singapore like it cooler (15.3°C). The Taiwanese do not like World Heritage Sites, but the others are indifferent. The Taiwanese and Chinese do not care about coasts, but tourists from Hong Kong and Singapore do prefer to travel to countries with long coast lines. Large countries attract more tourists; this effect is stronger for the Taiwanese than for the others. Political instability deters tourists from Singapore; the others are indifferent. Countries with ADS are considerably more popular than countries without; ADS applies to Chinese tourists only.

Altogether, this part of the analysis shows that ethnicity cannot be the sole basis for meaningful results on tourist behaviour.[13] It shows that although they have roughly the same ethnicity,[14] the people from these countries behave differently according to their residence. This leads to the conclusion that also social, political and recent historical conditions determine behaviour. We therefore concentrate in the following on the

[12] Note that we take the average tourist flows over five years. The ADS dummy is also averaged over the same five years.

[13] While it is perfectly valid to distinguish inbound tourists into Overseas Chinese and (ethnically diverse) foreigners, as Xiao (1997) does. The study proves that preferences of tourists differ along ethnicity and furthermore, the interaction – and with it the acceptance – of tourists and the residents of tourist cities is clearly depending on tourists' ethnic origin.

[14] With 75%, Singapore has the lowest share of Han.

Chinese from the People's Republic of China that also form the largest market of the four countries investigated.

3.2. Regression results: Provinces

For provinces, we cannot follow the general-to-specific variable selection procedure used for nations, because we have some 60 explanatory variables and only 31 observations. Therefore, we summed the separate indicators for cities, mountains, sights and spots. We used three alternative indicators for nature: relative and absolute area of nature reserves, and their number. We used three alternative sets of indicators for "geography": (1) temperature, precipitation and humidity; (2) latitude and longitude of the provincial capital; and (3) regional dummies. This leads to 9 models. We first estimated each model including all explanatory variables (see above), successively eliminating the insignificant and jointly insignificant ones.

Table A10 summarises the results. For domestic tourists, latitude and longitude do not describe the data very well. Regional dummies perform slightly better than do the climate variables, but as only the dummy for the Northeast is significant, we decide to add this dummy to the "climate" model. The absolute area of nature reserves performs better than the other two indicators. This consolidated model was used for sensitivity analysis on the supposed tourist attractions.

The aggregate "mountain" indicator is not significant, and this is true for the three alternative "mountain" indicators as well. The aggregate "spots" indicator is not significant, and this is true for all alternative "spots indicators", with the exception of "spots imp", which is added to the model. The aggregate "sights" indicator is significant, and so are the alternative indicators. However, the estimated parameters do not deviate significantly from each other. However, the sights from *Travel-China-Guide* outperform those of *Yiqilai*; the former guide is more influential. We therefore retain the aggregate indicator. The aggregate "cities" indicator is significant, and so are the alternative indicators. Again, estimated parameters do not differ significantly. The cities of *Yiqilai* are a better predictor than are the cities from CNTA. We therefore retain the aggregate indicator.

Table 3 has the regression results. Domestic tourist numbers are higher in provinces with more railways and highways, with a coast, with relatively rich inhabitants, with a higher population density, and with higher humidity. Tourist numbers are also higher in the Northeast (Heilongjiang, Jilin, Liaoning). Tourists are attracted by natural areas and by sights, but they avoid "cities" and "spots imp".

For foreigners visiting China, we followed the same procedure. Table A10 summarises the results of the initial regressions. The regression with the regional dummies performed poorly. Latitude and longitude performed slightly better than climate, so we combined these in a direct test of explanatory power; in the final model, latitude is maintained, but the climate variables are all insignificant. The absolute area of nature reserves outperforms both the relative size and the relative area.

The resulting consolidated model was again subject to sensitivity analyses on the tourist attraction indicators. The aggregate "cities", "mountains" and "sights" indicators are not significant, and the same is true for each of the alternative indicators. The aggregate "spots" indicator is significant. Most of the alternative indicators are not, however, with the exception of "C spots" and "imp/pres" spots".

Table 4 has the regression results. Like domestic tourists, foreign tourists are attracted to provinces with a dense railway network, relatively rich inhabitants, and a dense population. Foreign tourists do not care about highways, the coast and the climate. Like domestic tourists, foreign tourists are attracted to provinces with large nature reserves. Foreign tourists prefer the South of China. Unlike domestic tourists, foreign tourists do not care about "cities" or "sights", but they are attracted by "C spots" and deterred by "imp/pres" spots".

3.3. Discussion

Mountains are not significant; this is surprising for the domestic market. Airports are also not significant for either tourist groups; this is interesting, as most foreign tourism depends on flights as rail travel is too slow for most tours. It shows that a rising in number of airports in some regions has not culminated in a raised number of foreign (or domestic) tourists there. Therefore the sightseeing features are a major reason to go, not the easy access.

A small number of variables are significant for both markets. A dense railways network is important. The railway is the main Chinese transportation mode (Xu 1999), therefore it is not surprising to find, that a dense railroad network affects domestic tourism positively. For foreign tourists, the access to sightseeing features outside the major cities also largely depends on railroads connections.

Tourists are attracted to wealthy provinces. In relation with the high development rate of the coastal Eastern and Southern regions of China, this means that domestic tourists generally prefer the rich coastal regions. Because data is lacking, we cannot say where domestic tourists come from, but travellers probably also come from richer regions (the major cities and the coastal regions). This would imply that domestic tourists stay relatively close to home.

Population density has a positive effect on tourism numbers, too. Generally, Chinese people are not irritated by the fact that sightseeing areas are often very busy, if not overcrowded, while foreigners expect to find this, and to them it is part of the China experience.

Both groups prefer nature. The extent of the natural area is significant and not the number of nature reserves in a province, nor the number of nature spots. Nature spots are advertised, but tourists are apparently not seduced, even though they do like nature. This may alert Chinese planners that a raise in numbers of natural attractions does not make up for the loss of nature through uncontrolled development.

Nature is more important to Chinese tourists than is culture. In fact, imperial spots are avoided, while the other cultural spots are irrelevant. For foreign tourists, C spots are attractive, which indicates that Chinese culture is the second main reason for foreigners to go to China – at least according to our analysis. Chinese tourists have a similar preference for nature when travelling abroad. This result corresponds to Kim *et al.* (2005) and Ghimire and Li (2001, table 4.7). The disinterest of domestic Chinese tourists in culture does not rule out that the same tourists would be interested in foreign culture when going abroad. This is in fact indicated by Kim *et al.* (2005), who show that the Chinese are interested in other cultures provided they are as old as their own. Sofield and Li (1998 after Petersen 1995) identify a notion of cultural pilgrimage in domestic tourism as an impact of a strong sense of Chineseness. This would anticipate a stronger indication for cultural preference in our results.

Domestic tourism is also significantly influenced by the following variables: highways, coast, humidity, cities (negative), imperial time spots (negative), the Northeastern regions and tourist sights. A dense highway network correlates with the domestic tourism numbers. Coach/bus is the second popular transportation mode for Chinese tourists. But as it is very exhausting, generally less secure and more time consuming than the railway, it is less suitable for carrying foreign tourists; especially for longer distances.

Coastal provinces attract domestic tourism. Like many East-Asian people, the Chinese generally do not sunbath, as a fair complexion is highly prestigious. They may like to be at the coast, but in China a day at the beach is not comparable to tourists' behaviour in the Mediterranean. It is highly questionable whether the variable coast here can serve as an indicator for a preference of water/beach. It may rather reflect the bias towards rich and trendy.

Domestic tourism numbers negatively correlate to the number of cities as promoted by official Chinese sources. This lack of interest in cities is a contrast to the high population density and a high GDP in preferred tourism provinces. In fact, cities as tourist destinations are less sought after, which does not exclude that the province has many cities or is less populated. This corresponds with their preference for nature.

Tourist sights – as promoted by tourism providers - are preferred by domestic tourists, whereas tourist spots are insignificant. The Travel-China-Guide, the commercial provider, is more significant than Yiqilai, the self-help network. This could be explained by the latter's unusual format for China. The fact that sights are significant while spots are not leads to the conclusion that the advertisements by official and other providers are more important to Chinese tourists than the actual spots that are there.

For foreign tourism a smaller number of variables is significant. The Southern region is preferred. This makes sense considering the high number of Overseas Chinese[15] that contribute to the foreign tourism number in China. These mainly stem from clans from the Southern and partly Eastern coast (Fujian and Zhejiang). For visitors from Macau and Hong Kong alone the main entrance gate to China is Guangdong in the South (Zhang and Lam 1999). Likewise Taiwanese citizens enter China via Hong Kong, as a direct connection between Taiwan and the People's Republic is limited to specific holidays, e.g. Chinese New Year[16].

For foreign tourism, the number of tourist spots is significant. Due to the character of our database these rather reflect the existence of reasonably well-known and recommended attractions. This distinguishes them from the tourist sights that rather reflect a providers' choice of attractions. However, the mix of all sources by our database best reflects their preferences; this indicates that they inform themselves more broadly. In contrast, Chinese tourists depend on a fewer number of sources and are likely to be more influenced by the promotion of attractions.

Although Chinese tourists and foreign tourists alike are interested in provinces with a high share of natural area, it is the provinces with a high number of cultural spots that attract most foreign tourists. This is understandable as the Chinese culture is unique and therefore likely to be a major reason for many tourists to visit the country. Ethnic Chinese may visit the country in search for their cultural roots.

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[15] Generally, Chinese official statistics distinguish between foreigners, Overseas Chinese and so-called compatriots from Hong Kong, Macao, Taiwan. We term the last two categories together as Overseas.
[16] This relaxation policy has only been introduced in 2005 and is still restricted to very few flights.

Foreign tourists avoid the combination of imperial and modern times. Altogether the spots of imperial and modern time code combination (4) are few in number compared to modern only (170) or imperial only (488). It may be a cautious indicator that foreign tourists seek the original and prefer ruins to modernised, re-built variations of ancient themes.

Cities, which are shunned by domestic tourists, are irrelevant to foreign tourists. This again indicates that sightseeing features are less put into relation to a city. For foreigners it is the spot that lets them visit places, rather than the city. In this context the less easy access to spots in rural areas compared to spots in cities are not likely to hinder foreigners' visits. A less than average growth rate of international visitors to major cities as Beijing and Shanghai also corresponds to their loss of the East theme like Cheung (1999) observes for Hong Kong.[17] The urban theme of a city is not important for foreigners visiting China.

Coastal and climate variables are insignificant to foreign tourism. This does not contradict the finding of Wen *et al.* (2003) that 80% of China's inbound tourists in 1995 went to coastal localities. They explain the coastal bias with the numerically strong group of Overseas Chinese that originate mainly from Fujian and Guangdong and the group of business travellers that concentrate on the special economic zones that are mainly situated along the coast. Our regression analysis shows that it might be the coastal provinces that draw inbound tourists but not the coast length. As we found that coast is significant for domestic tourists but not for foreigners[18] this feeds the assumption that foreigners do not go to China for a beach holiday, which is not surprising given the high pollution and artificial surrounding of most Chinese beaches.[19] Likewise it is not the climatic conditions driving foreigners to make a holiday in China. This is also found by Hamilton and Lau (2006) investigating the role climate plays in destination decision making of German holiday makers.

Comparing the preferences of foreign and domestic tourists in China, we find major differences between these groups. If the preferences domestic and foreign tourists have for China vary, they are also likely to differ for other destinations. A foreign tourism provider targeting the Chinese market would have to adapt the supply.

4. Market potential

Table 5 shows the market share of international tourism from China, according to the consolidated regression model of Table 2. In the first columns, the situation in 1997-2001 is shown. The most popular countries and their order roughly correspond to the observed pattern shown in Table A6. The Approved Destination Status (ADS) is highly significant in explaining the destination choice of Chinese tourists. In the middle columns, we update the ADS to the situation of June 2006. Japan, Brazil, the countries of the European Union and Mongolia all gain considerable market share, at the expense of Macau, Thailand, the USA, Malaysia, the Philippines and Canada. In the last

[17] Cheung (1999) states Hong Kong has gradually lost its traditional East theme – that was in marketing strategies always linked to the modern West theme of the place. There is some indication that the same happens to Beijing and especially Shanghai as the old towns are sacrificed to yet another modern skyscraper.

[18] Mind we address the whole of inbound tourism as foreign tourism here therefore we can compare our findings to the ones by Wen *et al.* (2003).

[19] The evaluation through the travel cost method by Chen *et al.* (2004) concludes that the investigated beach in Xiamen is a recreational asset and an entrance fee should be introduced to serve its protection against deterioration.

columns, we show the market share if all (or no) countries would have ADS; on current trends, that may happen in the not too distant future; see Figure. The USA and Canada would benefit most, while the countries of Southeast Asia would drop out of the top 19 destinations. Thailand, currently the third-most popular country,[20] would come at place 20 only, and would see its market share fall by a factor 10.

The results in Table 5 show the power of the ADS system, and how this power is diminished as more and more country acquire ADS.

5. Conclusion

We study the behaviour of Chinese tourists, both in China and abroad, using regression analysis. For comparison, we also look at the behaviour of other tourists. We find that the preferences of Chinese and other tourists are different, both in China and abroad. It is no surprise that foreigners seek different things in a holiday in China than do the Chinese. When abroad, the Chinese behave differently than their kin from Hong Kong, Singapore and Taiwan. This implies that tourist operates wanting to tap the vast potential of the Chinese tourism market will have to design China-specific tourist offers.

When travelling in China, the Chinese are attracted to rich and densely population areas, but repelled by cities. They prefer easy access by road and rail, and are attracted by nature. Cultural attractions are less important, and may even put tourists off.

Intriguingly, Chinese tourists in China and Chinese tourists abroad are attracted bz the same things, at least in a qualitative sense. When travelling abroad, the Chinese are attracted to large and rich countries, and less deterred by distance than other travellers. The climate, coast, culture, and political stability of the destination do not matter. This implies that countries in northern and western Europe are preferred to the Mediterranean. The system of Approved Destination Status used to be very important, but this is eroding as more countries acquire ADS. At present, particularly Canada and the USA suffer from not having ADS, while Southeast Asian countries suffer most from the expansion of the ADS to other countries.

This study suffers from a number of drawbacks. Tourism data are crude, available per year (rather than season), per country (rather than province or state), and aggregated (rather than disaggregated between different holiday types). Data for potential explanatory variables (such as hotel prices and travel costs) cannot be had. This implies that the current study should be repeated on the basis of surveys of Chinese travellers. To our knowledge, such data does not exist. It is clear, however, that it is wrong to assume the Chinese to be like other tourists, even their ethnic kin. Given the scale of Chinese tourism, such research is hard needed.

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References

[20] according to the model; according to the data, Thailand is the second-most popular destination.
[21] The Northeast still features vast forest areas that are not necessarily listed as specific tourist attractions in our database.

Au, A.K.M., Ramasamy, B., & Yeung, M.C.H. (2005). The Effects of SARS on the Hong Kong Tourism Industry: An Empirical Evaluation. *Asia Pacific Journal of Tourism Research*, 10 (1), 85-94.

Bigano, A., Hamilton, J.M., Lau, M.A., Tol, R.S.J., & Zhou, Y. (2004). A global database of domestic and international tourist numbers at natioanl and subnational level. Working Paper FNU 54. Hamburg University and Centre for Marine and Atmospheric Sciences, Hamburg. http://www.uni-hamburg.de/Wiss/FB/15/Sustainability/Working_Papers.htm

Bigano, A., Hamilton, J.M., & Tol, R.S.J. (2006). The impact of climate on holiday destination choice. *Climatic Change Online* (18 March 2006).

Chen, W.Q., Hong, H.S., Liu, Y., Zhang, L.P., Hou, X.F., & Raymond, M. (2004). Recreation demand and economic value: An application of travel cost method for Xiamen Island. *Chína Economic Review*, 15 (4), 398/406.

Cheung, S.C.H. (1999). The Meaning of a Heritage Trail in Hong Kong. *Annals of Tourism Research*, 26 (3), 570-588.

China National Bureau of Statistics (CNBS): www.stats.gov.cn

CNBS (2003). *China Statistical Yearbook 2003*. No.22. Beijing: China Statistics Press.

China National Tourism Administration (CNTA): www.cnta.gov.cn.

CNTA (2003). *Chinese tourists bring vitality to German market.* www.cnta.gov.cn/lyen/gl/1_view.asp?id=2949 (last viewed: 9 February 2006).

CNTA (2006). www.cnta.gov.cn/chujing/chujing.htm (last viewed: 9 March 2006).

China National Tourist Office (CNTO Toronto (2004). www.tourismchina-ca.com/statistics00.htm (last viewed 24 June 2004).

Chu, Y.F. (1994). Evaluation of Sightseeing Areas in China. *Annals of Tourism Research*, 21 (4), 837-839.

CIA, 2002: *The World Factbook 2002*. Central Intelligence Agency, Washington, D.C., USA. Retrieved from http://www.cia.gov/cia/publications/factbook

Cummings, J., Storey, R., Strauss, R., Buckley, M., & Samagalski, A. (1991). *China.* Lonely Planet – A Travel Survival Kit. 3rd edition. Hawthorn and Berkeley.

DZT (Deutsche Zentrale für Tourismus e.V.) (2005). *Incoming-Tourismus Deutschland*. Edition 2005. www.deutschland-tourismus.de (last viewed: December 2005).

Economist (2006), China and Tourism – Golden Years, *The Economist*, May 13, 2006, 60.

Enright, M.J., & Newton, J. (2005). Determinants of Tourism Destination Competitiveness in Asia Pacific: Comprehensiveness and Universality. *Journal of Travel Research,* 43, 339-350.

Euromonitor (2002). *Global Market Information Database*. www.gmid.euromonitor.com.

FAZ (Frankfurter Allgemeine Zeitung) (2003). *Die Chinesen werden die neuen Reiseweltmeister*. No 297 (22 December 2003), 15.

Ghimire, K.B., & Li, Z. (2001). The Economic Role of National Tourism in China. In K.B. Ghimire (Ed.), *The Native Tourist – Mass Tourism within Developing Countries* (pp.86-108). UNRISD (United Nations Research Institute for Social Development). London: Earth Scan.

HA (Hamburger Abendblatt) (2005): *Chinesen buchen 850 000 Übernachtungen*. (7 December 2005). www.abendblatt.de/daten/2005/12/07/510960.html?prx=1 (last viewed 7 December 2005).

Hall, C.M. (1994). *Tourism and Politics – Policy, Power and Place*. Chichester: John Wiley and Sons.

Hamilton, J.M., & Lau, M.A. (2006): The role of climate information in tourist destination choice decision making. In S. Gössling, & M. Hall (Eds.), *Tourism and Global Environmental Change – Ecological, Social, Economic and Political Interrelationships*. Oxon and New Jersey: Routledge.

Hoffmann, C. (2005). *Die Chinesen kommen*. FAZ, No.45 (13 November 2005), 49.

Invest Hong Kong (2004). www.investhk.gov.hk/keysectors9.aspx?id=534&code=GPRDBKFATCSTOU (last viewed 27 May 2004).

Jenkins, C.L., & Henry, B.M. (1982). Government involvement in tourism in developing countries. *Annals of Tourism Research,* 9, 499-521. And in C. Tisdell (Ed.) (2000), *The Economics of Tourism, Volume II*.

Kaufmann, D., A. Kraay & P. Zoido-Lobaton, 1999: Governance Matters. Policy Research Working Paper 2196. World Bank, Washington, USA.

Kim, S.S., Guo Y.Z., & Agrusa, J. (2005). Preference and Positioning Analyses of Overseas Destination by Mainland Chinese Outbound Pleasure Tourists. *Journal of Travel Research,* 44, 212-220.

Let's go Publications (2000). *Let's go: China*. Basingstoke and Oxford: Macmillan.

Lise, W., & Tol, R.S.J. (2002). The Impact of Climate on Tourism Demand. *Climatic Change,* 55 (4), 429-449.

New, M., Hulme, M. and P.D. Jones, 1999: Representing Twentieth Century Space-Time Climate Variability, Part I: Development of a 1961-1990 Mean Monthly Terrestrial Climatology. *Journal of Climate*, **12**, 829-856.

People's Daily (2001). *Guizhou Welcomes Overseas Investment in Boosting Tourism*. (25 March 2001). http://english.people.com.cn/english/200103/25/print20010325_65916.html (last viewed: 19 July 2005).

People's Daily (2003). *TUI, China Travel Service Set Up Joint Venture*. (9 September 2003). http://english.people.com.cn/200309/09/eng20030909_124002.shtml (last viewed: 12 January 2006).

People's Daily (2006). *Tourism*. http://english.people.com.cn/data/China_in_brief/Economy/Tourism.html (last viewed: 12 January 2006).

Reisinger, Y., & Turner, L.W. (2002a). Cultural Differences between Asian Tourist Markets and Australian Hosts, Part 1. *Journal of Travel Research*, 40, 295-315.

Reisinger, Y., & Turner, L.W.(2002b). Cultural Differences between Asian Tourist Markets and Australian Hosts, Part 2. *Journal of Travel Research*, 40, 374-384.

Richards, G. (2000). Tourism and Culture. In H. Briassoulis, & J. van der Straaten (Eds.), *Tourism and the Environment – Regional, Economic, Cultural and Policy Issues* (pp. 165-178). (2nd ed.). Dordrecht: Kluwer Academic Publishers.

Richter, L.K. (1983). Political Implications of Chinese Tourism Policy. *Annals of Tourism Research*, 10, 395-413.

Ryan, C. (2003). *Recreational Tourism – Demand and Impacts*. Aspects of Tourism 11. Clevedon, Buffalo, Toronto and Sydney: Channel View Publications.

Shaw, G., & Williams, A.M. (2004). *Tourism and Tourism Spaces*. London: Sage Publications, (Chapter 10).

Schwickert, P. (1989). *Freizeitgestaltung und Binnentourismus in der VR China – Unter Berücksichtigung des autochthonen Erholungsstils im urbanen Raum*. Universität Trier.

Sofield, T.H.B., & Li, F.M.S. (1998). Tourism development and cultural policies in China. *Annals of Tourism Research*, 25 (2), 362-392.

Times Atlas of the World (1994), 9th Comprehensive Edition, Harper Collins, London.

Tisdell, C., & Wen, J. (1991). Foreign tourism as an element in PR China's economic development strategy. *Tourism management*, 12 (1), 55-67.

Travel-China-Guide: www.travelchinaguide.com (last viewed: 2 February 2006).

UNESCO (United Nations Educational Scientific and Cultural Organization) (2006). http://whc.unesco.org/en/list/?search=&search_by_country=&type=Mixed&media=&region=2&order=country (last viewed: 27 March 2006)

Verhelst, V. (2003). *Study of the Outbound Tourism Industry of the People's republic of China – The Probability of a Bilateral ADS Agreement between the PRC and the Shengen Area*. M.A. thesis. Department of Oriental and Eastern European Studies, Katholieke Universiteit Leuven.

Wen, J.J., & Tisdell, C.A. (2001). *Tourism and China's Development – Policies, Regional Economic Growth and Ecotourism.* Singapore, New Jersey, London, Hong Kong: World Scientific Publishing.

Wen, J., Tisdell, C.A., & Roy, K.C. (2003). Regional Inequalities in Tourism Development: Experiences of China and India. In R.N. Gosh, M.A.B. Siddique, & R. Gabbay (eds.), *Tourism and economic development: case studies from the Indian Ocean Region* (Chapter 7). Hamshire and Burlington: Ashgate Publishing Ltd..

World Economic Forum (2003). *China's Tourism Potential.* www.weforum.org/site/homepublic.nst/Content/China+Business+Summit+2004%5CChina's+tourism+potential (last viewed: 4 October 2004).

WRI, 2002: *World Resources Database 2002-2003*. World Resources Institute, Washington, D.C., USA

WTO (2003a). *Yearbook of Tourism Statistics*. World Tourism Organisation, Madrid.

WTO (2003b). *Chinese Outbound Tourism.* World Tourism Organisation, Madrid.

Xiao, H.G. (1997). Tourism and Leisure in China: A Tale of Two Cities. *Annals of Tourism Research*, 24 (2), 357-370.

Xu, G. (1999). *Tourism and Local Economic Development in China – Case Studies of Guilin, Suzhou ands Beidaihe.* English-language Series of the Institute of Asian Affairs, Hamburg, No 4. Richmond: Curzon.

Yiqilai zizhu lüyou wang: www.17lai.com (last viewed: 2 February 2006).

Zhang G.R., & Lew, A.A. (2003). Introduction: China's Tourism Boom. In A.A. Lew, L. Yu, J. Ap, & Zhang G.R. (Eds.), *Tourism in China*. N.Y.: Haworth Hospitality Press.

Zhang, Q.H.Q., & Lam, T. (1999). An analysis of Mainland Chinese visitor's motivations to visit Hong Kong. *Tourism Management*, 20, 587-594.

Zhang, Q.H.Q., Chong, K., & Ap, J. (1999). An analysis of tourism policy development in modern China. *Tourism Management*, 20, 471-485.

Zhang, W. (1997): China's domestic tourism: impetus, development and trends. *Tourism Management*, 18 (8), 565-571.

Table 1: Explanatory variables

DATA China 2002 per Region				
Category	**Sub-category**	**Unit explanation**	**Unit measured**	**Unit detailed**
Tourist Spots		Total	Number	
	classification	compare Table A7	Number	C,CN,N,O,OM
	time code	compare Table A7	Number	none, pres, pres/rev, rev, rev/imp, imp, imp/pres, imp/ant, ant, preh
Mountains	*source*	Yiqilai	Number	
		Travel-China-Guide	Number	
	status	wuyue, budd and dao ('holy')	Dummy	
Sights classifications ('must sees')	*source*	Travel-China-Guide	Number	C, N, C+N
		Yiqilai	Number	C, N, C+N
Tourist Cities	*source*	Yiqilai	Number	excellent tourist cities, historical famous cities, total tourist cities (excl. doubles)
		CNTA	Number	top tourist cities, second rank tourist cities, total tourist cities
Regions	*groups*		Dummy	N, NE, E, S, SW, NW
	coast/non-coast		Dummy	
Transportation	*civil airports*	total	Number	
	railways	length in operation	in km	
	highways	total length	in km	
Climate	*temperature*	annual average in province capital	° C	
	relative humidity	annual average in province capital	%	
	precipitation	annual total in province capital	Mm	
Physical conditions	*area*	Total	square km	
	coast length	Total	M	
	longitude	province capital	Min	
	latitude	province capital	Min	
Population	*population*	total (year-end)	number 10 000	
		Density	pop/sq km	
	minority population	percentage to total population in minorities areas	%	
Economy	*GDP*	Total	100 Mio RMB	
	GDP	Per capita	100 Mio RMB	
Tourism	*domestic*	total	number in 10 000	
		Revenue	100 Mio RMB	
	international	total	number 10 000	
		Revenue	100000 US$	
Natural conditions	*nature reserves*	Number	Unit	
		area	10 000	

	pollution accidents	Percentage Total	hectares % Number	

Table 2: Regression results for Han Chinese tourists abroad

		China		Taiwan		Hong Kong		Singapore	
		full	consolidated	full	consolidated	full	consolidated	full	consolidated
Constant		18.12 (3.66)	13.77 (1.60)	20.06 (4.89)	23.67 (3.85)	26.89 (4.28)	26.83 (3.61)	31.02 (3.17)	32.55 (2.99)
Domestic		-5.14 (3.89)							
Distance		-1.69 (0.44)	-1.26 (0.17)	-2.60 (0.51)	-2.82 (0.43)	-3.52 (0.46)	-3.72 (0.40)	-3.26 (0.30)	-3.22 (0.31)
Income		0.44 (0.23)	0.64 (0.13)	0.99 (0.39)	1.07 (0.19)	0.87 (0.35)	1.21 (0.20)	0.24 (0.28)	
Temp		0.24 (0.13)		0.18 (0.18)		0.28 (0.16)	0.43 (0.15)	0.39 (0.14)	0.46 (0.14)
$Temp^2$	10-2	-0.77 (0.40)		-0.26 (0.62)		-0.50 (0.57)	-1.29 (0.50)	-1.19 (0.46)	-1.50 (0.45)
Heritage	10-2	-0.03 (0.02)		0.50 (0.66)	-0.08 (0.05)	1.26 (0.63)		0.82 (0.55)	
Coast	10-4	0.10 (0.09)		0.14 (0.14)		0.27 (0.11)	0.31 (0.11)	0.25 (0.10)	0.29 (0.10)
Area	10-6	0.31 (0.11)	0.32 (0.09)	0.44 (0.18)	0.49 (0.14)	0.42 (0.14)	0.33 (0.13)	0.38 (0.10)	0.35 (0.11)
Stability		0.31 (0.40)		0.59 (0.73)		1.06 (0.67)		1.24 (0.49)	1.38 (0.34)
ADS		2.45 (1.06)	3.45 (0.81)						
R^2		0.71	0.72	0.65	0.65	0.79	0.77	0.82	0.79
N		61	72	37	48	32	39	39	42

Numbers in parentheses are standard deviations.

Table 3: Regression results. Dependant variable: Ln(Number of domestic tourists).

Variable	Coefficient	Std. Error	t-statistic
Constant	-13.720	1.698	-8.08
Ln(Railways)	0.206	0.098	2.12
Ln(Highways)	0.797	0.141	5.64
Ln(Coast+1)	0.019	0.008	2.36
Ln(Cities)	-0.514	0.086	-5.96
Ln(Sights)	0.503	0.076	6.60
Ln(GDP/capita)	0.444	0.096	4.64
Ln(Population density)	0.730	0.056	13.14
Ln(Humidity)	0.831	0.294	2.83
Ln(Natural area)	0.106	0.050	2.11
Northeast	0.871	0.198	4.40
Ln(Spots imp)	-0.150	0.069	-2.17
R^2	0.986	N	31

Table 4. Regression results. Dependant variable: Ln(Number of foreign tourists).

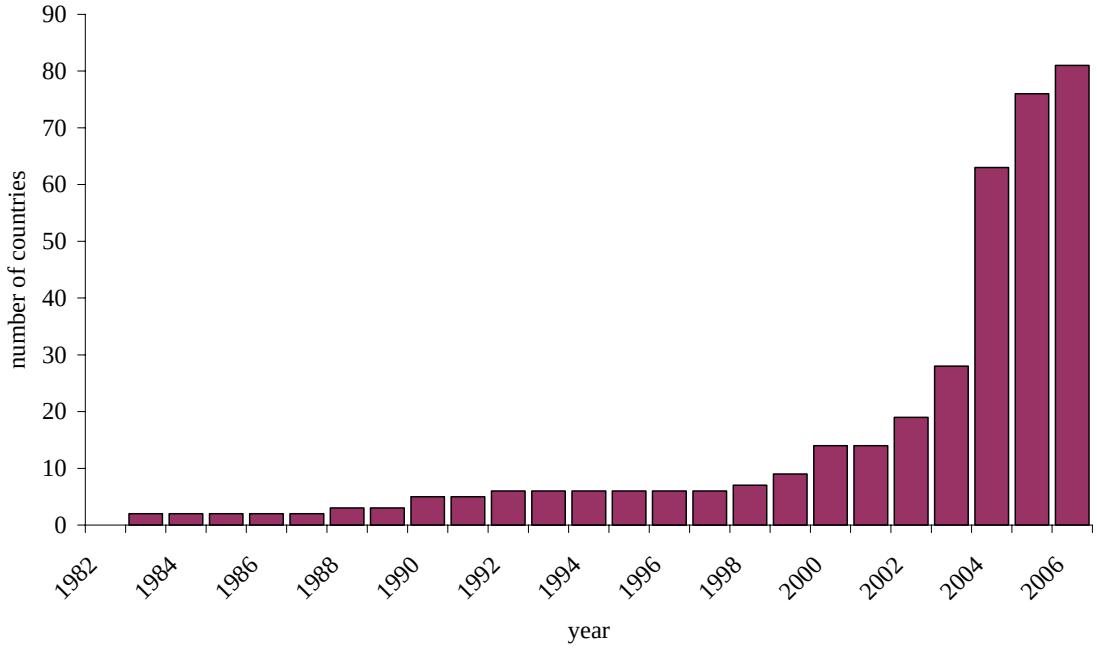
Variable	Coefficient	Std. Error	t-Statistic
Constant	-9.358	2.164	-4.32
Ln(Railways)	0.856	0.137	6.26
Ln(1+Spots C)	0.352	0.141	2.49
Ln(1+Spots pres/imp)	-1.245	0.373	-3.34
Ln(GDP/capita)	1.752	0.208	8.41
Ln(Population density)	0.352	0.115	3.06
Ln(Natural area)	0.225	0.106	2.12
Ln(Latitude)	-3.651	0.514	-7.10
R^2	0.923	N	31

Table 5. Market share (fraction) of international tourists from China for the Approved Destination Status (ADS) system of 2001 and 2006, and for the hypothetical case there would be no ADS system.

ADS 2001		ADS 2006		No ADS	
Macau	0.359	Japan	0.188	USA	0.288
Japan	0.117	Macau	0.073	Canada	0.131
Thailand	0.099	Brazil	0.045	Japan	0.090
USA	0.094	Norway	0.035	Macau	0.035
Malaysia	0.086	Finland	0.033	Brazil	0.022
Philippines	0.060	Denmark	0.032	Cayman Islands	0.022
Canada	0.043	Switzerland	0.032	Norway	0.017
Brazil	0.007	Luxembourg	0.032	Finland	0.016
Cayman Islands	0.007	Germany	0.031	Denmark	0.015
Norway	0.006	Mongolia	0.029	Switzerland	0.015
Finland	0.005	Austria	0.028	Luxembourg	0.015
Denmark	0.005	France	0.027	Germany	0.015
Switzerland	0.005	Iceland	0.024	Mongolia	0.014
Luxembourg	0.005	Belgium	0.024	Austria	0.013
Germany	0.005	Netherlands	0.024	France	0.013
Mongolia	0.005	Italy	0.020	Iceland	0.012
Austria	0.004	Thailand	0.020	Belgium	0.011
France	0.004	USA	0.019	Netherlands	0.011
Iceland	0.004	Malaysia	0.017	Italy	0.010
Belgium	0.004	Spain	0.015	Thailand	0.010

Figure 1: Provinces and regions of China.

Figure 2. Number of countries with ADS as a function of time.



APPENDIX 1: DATA AND SOURCES

A1. The database

We aimed at providing a comprehensive database of important tourist spots throughout China. The data break down to the county level. The data have been used for statistical regression analysis on province level.[22] The county level data of tourist spots are the basis for descriptive analysis of the spatial distribution and the number of administrative units that feature important tourist spots. The data are also useful for GIS application.

A1.1. Data sources

For compilation of tourist spots we collected tourist spots from 6 sources on a national basis (Chinese and foreign origin as well as in Chinese and English language) and an additional 46 local Chinese sources (all in Chinese language). We used the information provided by the China National Tourism administration (CNTA) and compared it to the information given by a Chinese non-commercial self-help travel network with expert support (*Yiqilai zizhu lüyou wang*, Yiqilai hereafter). The latter reflects the preferences Chinese tourists have in contrast to what the official tourism administration defines as must-sees. Further, we added a third source, of a mainly commercial character, the Travel-China-Guide.[23] All sources are freely accessible websites, except the two foreign sources for which we used the paperback print versions. Table A1 shows the different source groups and their numbers. Table A2 specifies the local sources used.

All sources were combined into five groups representing variations of language (Chinese or English), the status of the source (official and/or commercial), the scale of the application (national or local), and the target groups (domestic and/or foreign tourists). In case that the information on tourist spots was presented in a ranking order (such as the 4A-A ranking system of official Chinese tourism marketing), the absolute occurrence within the ranking system decided. Two groups were categorized like this and therefore only one source represents each of these groups. All other groups were formed from more than one source. Only the group of local sources was presented by at least one source and for nearly half of the provinces (15) a second source was consulted.

A1.2. Data details: Years

We use sources from different years. The information from the internet was gathered throughout 2004 - mid 2005. However, most English-language information on the Chinese websites is older. In the case of 4A-A ranking by the CNTA this becomes most clear. The English-language lists on the web resemble the Chinese-language lists from 2001. For province-based statistical regression analysis, i.e. for the database of spot numbers, end of 2001 data are used, as this is the information people had for their decision on a holiday destination in 2002. For the trend assessment of these ranked 4A-A spots all accessible data from 2001-2004 in Chinese language are taken. The foreign travel guides used are from 1991 and 2000. They therefore not only cover two different publications with possible bias for certain regions, but also a time scale comparable to other information used. The 1991 publication is not necessarily limiting the spots in the

[22] As there are no county data on tourist arrivals for China.
[23] In Table A1, this source ranges under half-commercial, half-official, as the Xi'an International Studies University is involved.

database[24] as spots newly opened to the public may have been taken up by the 2000 publication.

A2. Data abstraction methodology

The compiled data were numerous and their number had to be limited to a workable size. Furthermore the data needed classification into groups of tourist attractions which had to serve the research questions. In the following this process of sorting and classifying data is explained.

A2.1. Classification of spots

Altogether we collected 2499 tourist spots. For groups 1 to 3 and 5 all spots mentioned by the sources were considered. We assume that a local source always presents the most elaborate choice of spots in order to raise revenue through tourism expenditure in the region. Therefore, from the local Chinese sources only those spots that were mentioned before by the other source groups were included in the database. This explains the relatively low number of total collected spots. Generally, a considered spot was only included in the final database, when it was mentioned by at least two sources of separate groups.

We finally extracted a database of 1325 important tourist spots for the whole of China. We further added information for classification of these spots. In order to do so we oriented ourselves along the classification the UNESCO (2006) uses for its heritage sites,[25] which is cultural or natural or both. Only, we termed the latter CN as a combination out of cultural (C) and natural (N).[26] Table A3 gives an overview. We furthermore added another classification of other (O), including all spots that cannot be exclusively associated with culture or nature.[27] This group includes, for instance, golf courses, which are neither a natural sight - as they are artificially built, nor a cultural sight - as they do not represent a cultural item, unless sports were to be perceived as cultural. Any spot that was represented in two classifications at a time –always in combination with O – falls under the classification of OM. These are for example the Dujiangyan Irrigation System in Sichuan, which is on the one hand a cultural feature, as it was started by Li Bing 250 BC, but it is still in use as a flood regulation structure and therefore constantly modernised and rebuild to latest standards. A classification either into C or O would not pay this tourist spot justice, therefore it is included into OM. OM-combinations of O and N are mostly resembling natural sights that are scenic and well known for specific sports activities, such as the Mengdong River in Hunan, which is a popular rafting area. Altogether there are 42 OM spots in the database, a mere 3.2%,

[24] Most features mentioned in the foreign sources are clearly classified as C (cultural) or N (natural) and only seldom as O (other) features. Please refer to the next paragraph on classification of spots for details of methodology.

[25] Although we do not adopt it for the individual spots, but re-define the categories. Further our CN classification does not resemble UNESCO's 'cultural landscapes'.

[26] The CN classification pays justice to the fact that often nature cannot be viewed in isolation from culture (Richards 2000). Sofield and Li (1998) formulate that 'the distinctions which might be drawn in other countries between cultural forms and physical features are often not possible in China' (p.379) and 'many of the most scenic localities are not only a gift of nature but also the product of thousands of years of wisdom and hard work by Chinese people' (p.378, after Zhang 1995, p.43).

[27] The O and OM classifications are stimulated by Shaw and Williams' (2004) view on natural theme park attractions.

which shows that most spots could clearly be classified within the four units of C, CN, N and O.

An additional classification aims at reflecting the time epoch most important for C, CN and to some extent O spots. We distinguished into

- the present modern times (pres) beginning with the founding of the People's Republic of China in 1949;
- the revolutionary period (rev) from 1911 to 1949;
- the imperial time (imp) starting with the first imperial dynasty that unified the country Qin (221 BC) until the fall of the last dynasty Qing in 1911;
- the antiquity period (ant) with the mystic dynasties of Xia, Shang and Zhou (2200 BC – 221 BC); and
- the prehistorical period (preh) of paleolithic, neolithic and bronze ages (until 2200 BC).

Table A3 shows that most attributions were straightforward - e.g. architecture is C, and nature, as for example lakes, are N – but there are some features that can be found in two distinct classes.

Gardens are considered N as botanical gardens, but gardens that predominantly combine architecture and nature – as typical for Chinese horticulture (Schwickert 1989), e.g. the Classical Gardens of Suzhou in Jiangsu province – are classified CN. Likewise is any garden with major integrated temple complexes.

Equally, Hot springs and Pools are generally considered N, if not combined with ancient temples or utility architecture, which turns them into CN.

All Parks are N including the public parks (*gongyuan*) that are featured in every Chinese town or city.[28] That way only parks with temple complexes (that must be at least from pre-1949) are considered CN. Exhibition and event parks, such as Science and Technology Parks, Film Parks and Amusement Parks are O.

Mountains are classified as N, unless there are major temples situated on them, in this case they are CN. All sacred or holy mountains of China - these are the five holy mountains (*wu yue*) and four major Buddhist and Daoist mountains each - are also CN. Only one mountain, that is exclusively brought into context with a temple sight counts as C. Table A4 shows an overview of all major Chinese mountains.

Museums are distinguished into Natural Museums that are classified CN, as they are not a natural feature themselves, museums with cultural focus are C, and other kind of museums – e.g. industrial ones – are O.

Towns as tourism centres, e.g. seaside resorts, are CN. Cities well known for their ancient, historical parts and former dynastic capitals are C. Towns as centres of special crafts and industries are O. Ethnic Villages range under C. Whereas Ethnic Festivals are CN, as these are mostly linked to natural features as well, Religious Festivals are C and all other Festivals are O.

[28] This may seem inadequate to the Western perception of a park, as the Chinese *gongyuan* are sometimes very small and mostly very artificial. They are widely paved and used as assembling points by the urban population to pursue *qigong* gymnastics, play Mahjong or dance waltz. But these parks serve the same purpose as larger and more natural ones in the West, i.e. to be a place to escape to from small apartments in urban areas (compare Schwickert 1989); this way it largely substitutes the lack of an own garden or balcony. Cultural preferences may be different, but the intention of providing these parks is comparable, therefore we include the *gongyuan* in N.

A2.2. Filtering important spots

As a control factor we included a group '0' in the qualitative analysis stage, that indicates which tourism spots are either included in the World Heritage Sites of the UNESCO or the CNTA list of Major National Scenic Resorts. The latter list was verified by the list of Most Famous Sites (*guojia zhongdian lüyou fengjingqu*) by Yiqilai.[29] Surprisingly, the Chinese UNESCO list, published by CNTA deviates from the official UNESCO list. Altogether three sites were missing: two of which were classified UNESCO site only after 2001 (These are the Three parallel rivers of Yunnan and the Capital cities and tombs of the Koguryo Kingdom in Jilin). Therefore, this proves that the CNTA information on the web is outdated. One site was classified in the year 2001 and was also not included (Yungang Shikou (Grottoes) in Shanxi). A comparison with the Yiqilai list (in Chinese) showed even more and different deviations.[30]

The only list on the web for the UNESCO sites of Chinese origin, that was complete, was provided by the Travel-China-Guide. We therefore adopted the index-system of China's major attractions by this provider and included all entries in our database, irrespective if they would have been included by our sampling system (i.e. mentioned by at least two sources out of two separate groups).[31] Even the use of the Travel-China-Guide-index as an active control group still excluded the Koguryo Kingdom remains from our database, which again is probably due to the fact, that it was assigned UNESCO status only in 2004 and was quite unknown before. The same applies to the three parallel rivers of Yunnan. A third UNESCO site was included in the database only by its representation through the index-system: Dali ancient town in Yunnan. Altogether 27 spots of the '0' control group are not included in the database. Most of them are N spots, mainly mountains.

[29] With only one exception: Dujiangyan in Sichuan was not included in here.

[30] In contrast to CNTA, this list included the three parallel rivers of Yunnan, but Yungang Shikou and the Koguryo Kingdom remains were equally missing. Instead of that the Ming tombs in Beijing were represented three times under different names. This also shows that a qualitative approach to the data is inevitable, as matching numbers could mislead.

[31] There are in fact six entries by the index that we could not verify with other sources. These were excluded from our database. They make 2.3% from the whole index-list.

Source	Year	Mode of information selection	Mode of source	Source language	Level	Targeted at
www.cnta.com; www.17lai.com	2001-4	Absolute occurrence in ranking system 4A – A	Chinese official	English and Chinese	National	Foreign and domestic tourists
www.cnta.com; www.china.org	2004	Absolute occurrence	Chinese official	English and Chinese	National	Foreign and domestic tourists
www.travelchinaguide.com	2004-5	Absolute occurrence in ranking system	Chinese official and commercial	English	National	Mostly foreign tourists
See Table A2	2004-5	Absolute occurrence	Chinese official	Mostly Chinese	Provincial / local	Mostly domestic tourists
Let's go publications (ed.) (2000): *Let's go: China.* Macmillan. Basingstoke and Oxford; Cummings *et al.* (1991): *China Lonely Planet*. Hawthorn. Berkeley.	1991, 2000	Absolute occurrence	Commercial English guides	English	National	Foreign travellers, mostly individual

Table A1: Source groups of provincial level analysis

Table A2: Local sources

Province	Local sources
Anhui	www.ahta.com.cn
Beijing	www.bjta.gov.cn; www.visitbeijing.com
Chongqing	www.cqta.gov.cn
Fujian	www.fjta.com
Gansu	www.joingansu.com; www.chinasilkroad.com
Guangdong	www.gdtravel.com
Guangxi	www.gxta.gov.cn
Guizhou	www.gz-travel.net
Hainan	hn.auyou.com; www.sun-sand-sea.com
Hebei	hb.auyou.com; www.hebeitour.com.cn)
Heilongjiang	www.longtour.net
Henan	www.hnta.cn
Hubei	www.hubeitour.gov.cn; hubei.auyou.com
Hunan	hunan.auyou.com; www.hnt.gov.cn)
Jiangsu	www.jstour.com
Jiangxi	jx.auyou.com; www.travel-jx.com
Jilin	jl.auyou.com; www.gotojilin.com
Liaoning	www.lntour.gov.cn
Nei Menggu	www.nmtravel.net; www.nmtour.gov.cn
Ningxia	nx.auyou.com; www.nx.com.cn
Qinghai	www.qhly.gov.cn; qh.auyou.com
Shaanxi	www.sxtour.com
Shandong	www.sdta.cn; sd.auyou.com
Shanghai	www.shanghaitour.net; sh.auyou.com
Shanxi	www.sxta.com.cn
Sichuan	www.scta.gov.cn
Tianjin	www.tj66.com.cn; www.tjtour.cn
Xinjiang	www.xinjiangtoure.gov.cn
Xizang	www.tibettour.com.cn; xz.auyou.com
Yunnan	www.traveloyunnan.com.cn
Zhejiang	www.tourzj.com

Table A3: Classification key

Natural	N	Botanical Gardens Gorges Caves Rivers Mountains/Hills Scenic Areas Forest Parks Grasslands Hot Springs Pools Lakes Deserts Parks (including all gongyuan)
Mixed	CN	Parks with Temple Complexes (pre-1949) Mountains with Temple Complexes (including all holy mountains) Gardens with Temple Complexes Pools and Hot Springs (within temple complexes) Natural Museums Towns as tourism centres (e.g. seaside resorts) Ethnic Festivals
Cultural	C	Towers Tombs /Mausoleums Pagodas Imperial Palaces Temples / Churches / Mosques / Monasteries Ruins Former Residences / Birthplaces of Famous People Memoial Halls Squares Bridges Museums (except Natural Museums) Cultural Parks Ethnic Villages Ancient Towns, Towns as dynastic capitals Religious Festivals Ethnic Markets
Other	O	Aquarium Zoos Science and Technology Parks Golf Clubs Film Parks Amusement Parks TV Towers / Skyscrapers Art Galleries Exhibitions / Fairs / Performances Towns as centres of special crafts or industries Festivals (except ethnic or religious) Markets (tourism and industrial)

		Other Museums (e.g. industrial)
Mixed (O)	OM	Nature or culture, with M
Time periods	pres	present modern times (since 1949)
	rev	revolutionary (1911-1945)
	imp	imperial (221 BC - 1911)
	ant	antiquity (2200 BC - 221 BC)
	preh	prehistorical (until 2200 BC)

Table A4: Mountains in China

Province	Mountains *(wu yue)*
Anhui	Huangshan, Jiuhuashan, Qiyunshan, Tianzhushan, Langyashan
Beijing	
Chongqing	Jinyunshan, Jinfoshan
Fujian	Wuyishan, Qingyuanshan, Wanshishan, Tailaoshan
Gansu	Maijishan
Guangdong	Xiqiaoshan, Danxiashan
Guangxi	Huashan, Qingxiushan
Guizhou	Fanjingshan
Hainan	
Hebei	Cangyanshan
Heilongjiang	
Henan	Songshan, Jigongshan
Hubei	Wudangshan, Dahongshan
Hunan	Hengshan, Shaoshan
Jiangsu	Zhongshan, Tiantaishan
Jiangxi	Lushan, Longhushan, Jingganshan, Sanqingshan
Jilin	
Liaoning	Qianshan
NeiMenggu	
Ningxia	
Qinghai	
Shaanxi	Huashan, Lishan
Shandong	Taishan, Laoshan
Shanghai	
Shanxi	Hengshan, Wutaishan
Sichuan	Emeishan, Qingchengshan, Gonggashan
Tianjin	
Xinjiang	Tianshan
Xizang	
Yunnan	Yulongxueshan
Zhejiang	Putuoshan, Yandangshan, Tiantaishan

Table A5: Countries with Approved Destination Status
(www.cnta.gov.cn/chujing/chujing.htm)

Number	Country/Region	Since	Applied to
1	Hong Kong	1983	China
2	Macao	1983	China
3	Thailand	1988	China
4	Singapore	1990	China
5	Malaysia	1990	China
6	Philippines	1992	China
7	Australia	1999	Beijing, Shanghai, Guangzhou
		2004/7	Tianjin, Hebei, Shandong, Jiangsu, Zhejiang, Chongqing
8	New Zealand	1999	Beijing, Shanghai, Guangzhou
		2004/7	Tianjin, Hebei, Shandong, Jiangsu, Zhejiang, Chongqing
9	South Korea	1998	China
10	Japan	2000	Beijing, Shanghai, Guangzhou
		2004/9/15	Liaoning, Tianjin, Shandong, Jiangsu, Zhejiang
		2005/7/25	China
11	Vietnam	2000	China
12	Cambodia	2000	China
13	Myanmar	2000	China
14	Brunei	2000	China
15	Nepal	2002	China
16	Indonesia	2002	China
17	Malta	2002	China
18	Turkey	2002	China
19	Egypt	2002	China
20	Germany	2003	China
21	India	2003	China
22	Maldives	2003	China
23	Sri Lanka	2003	China
24	South Africa	2003	China
25	Croatia	2003	China
26	Hungary	2003	China
27	Pakistan	2003	China
28	Cuba	2003	China
29	Greece	2004/9	China
30	France	2004/9	China
31	Netherlands	2004/9	China
32	Belgium	2004/9	China
33	Luxemburg	2004/9	China
34	Portugal	2004/9	China
35	Spain	2004/9	China
36	Italy	2004/9	China
37	Austria	2004/9	China
38	Finland	2004/9	China
39	Sweden	2004/9	China
40	Czech Republic	2004/9	China
41	Estonia	2004/9	China

42	Latvia	2004/9	China
43	Lithuania	2004/9	China
44	Poland	2004/9	China
45	Slovenia	2004/9	China
46	Slovakia	2004/9	China
47	Cyprus	2004/9	China
48	Denmark	2004/9	China
49	Iceland	2004/9	China
50	Ireland	2004/9	China
51	Norway	2004/9	China
52	Romania	2004/9	China
53	Switzerland	2004/9	China
54	Liechtenstein	2004/9	China
55	Ethiopia	2004/12	China
56	Zimbabwe	2004/12	China
57	Tanzania	2004/12	China
58	Mauritius	2004/12	China
59	Tunisia	2004/12	China
60	Seychelles	2004/12	China
61	Kenya	2004/12	China
62	Zambia	2004/12	China
63	Jordan	2004/12	China
64	Northern Mariana Islands	2005/4	China
65	Fiji	2005/5	China
66	Vanuatu	2005/5	China
67	U.K.	2005/7	China
68	Chile	2005/7	China
69	Jamaica	2005/7	China
70	Russia	2005/8	China
71	Brazil	2005/9	China
72	Mexico	2005/9	China
73	Peru	2005/9	China
74	Antigua and Barbuda	2005/9	China
75	Barbados	2005/9	China
76	Laos	2005/9	China
77	Mongolia	2006/3	China
78	Tonga	2006/3	China
79	Grenada	2006/3	China
80	Bahamas	2006/3	China
81	Saint Lucia	2006/3	China

APPENDIX 2: DESCRIPTIVE STATISTICS AND ADDITIONAL RESULTS

Table A6: Top 20 visitors to China, and Top 20 destinations of Chinese tourists; for comparison, visitor numbers from Taiwan, Hong Kong and Singapore are also shown.

To \ From	China	Taiwan	Hong Kong	Singapore	From \ To China	
Macau	824585	231455	1070845	6687	Japan	1919245
Thailand	439795	448280	472325	492089	South Korea	1085892
Japan	313183	862950	276171	66200	Russia	923012
Malaysia	277575	193443	96247	4753715	USA	775095
USA	209609	442780	222129	127109	Malaysia	388784
Germany	186918	68219			Singapore	360032
Italy	95086	24365	19058		Philippines	320656
Canada	66538	139444	153396	26226	UK	263215
Mongolia	59730	494	156	502	Germany	217330
Belgium	55039	6810	3551	3390	Canada	214835
Switzerland	44244	44690	39191	20615	Thailand	211751
Hawaii	29930	58130	27730	12080	Australia	207203
Indonesia	27918	356853	74457	1412186	Indonesia	175913
Cambodia	24942	22337	2385	11002	France	161891
Philippines	19645	147400	152748	48803	India	98121
Brazil	16345				Italy	73083
Myanmar	14424	30365	1583	10886	Netherlands	70040
Finland	14411	7502	1208	2034	Sweden	46446
Turkey	12156			7318	Pakistan	36819
Ukraine	10820	100		357	New Zealand	34336
China				360032		
Taiwan			307350	87767		

Table A7: Tourism data per province: Domestic and international tourist numbers (in 10,000 people) and revenue (100 mln RMB); all data are for 2002, except where indicated otherwise.

	Domestic		International			
	(10^4)	(10^8 RMB)	1986 (10^4)	(10^4)	(%/year)[a]	(10^8 RMB)
Anhui	3886	203	1	46	29.0	2
Beijing	11496	928	26	311	16.9	31
Chongqing	4620	202		46		2
Fujian	3931	333	10	185	*19.8*	11
Gansu	1035	27	1	24	**22.7**	1
Guangdong	7700	1010	72	1526	*21.0*	51
Guangxi	4887	204	11	130	*16.6*	22
Guizhou	2200	56	0	23	**29.0**	50
Hainan	1216	88	0	39		1
Hebei	5985	265	1	47	**25.8**	2
Heilongjiang	3349	179	1	72	**28.9**	3
Henan	6269	409	2	41	**23.0**	1
Hubei	6672	384	2	102	**27.7**	3
Hunan	5700	220	1	57	**32.9**	3
Jiangsu	9666	830	9	223	*6.5*	10
Jiangxi	3270	185	1	24	**27.5**	7162
Jilin	2454	108	1	29	**33.6**	1
Liaoning	6303	397	2	93	*20.5*	5
Nei Menggu	1153	82	0	44	**52.2**	1
Ningxia	305	12	0	1	*15.5*	161
Qinghai	418	14	0	4	**22.0**	999
Shaanxi	3733	158	8	85	*16.2*	4
Shandong	9573	572	1	98	**31.9**	5
Shanghai	8761	994	15	273	*20.0*	23
Shanxi	4360	120	1	25	**24.8**	7
Sichuan	7218	364	4	67	*18.9*	2
Tianjin	3710	390	2	50	**23.8**	3
Xinjiang	968	84	0	28	**43.0**	9942
Xizang	73	6	0	14	**33.5**	5166
Yunnan	5110	255	3	130	**26.2**	4
Zhejiang	8020	634	4	204	**28.7**	9

[a] Average annual growth rate between 1986 and 2002. The rate for China as a whole is 21.5%. Provinces with above (below) average growth are marked in **bold** (*italics*).

Table A8: Descriptive statistics tourist spots; see Table A3 for abbreviations.

Tourist Spots						
Sub-category	**Unit Detailed**	**Total**	**Max**	**Min**	**Median**	**Standard deviation**
		1325	110	11	42,7419	23,7907
Classification	**C**	558	39	4	18,0000	10,3344
	CN	184	26	0	5,9355	5,6210
	N	413	46	2	13,3226	10,2319
	O	128	17	0	4,1290	3,9811
	OM	42	5	0	1,3548	1,3552
time code	**None**	527	67	2	17,0000	14,0238
	Pres	170	15	0	5,4839	4,3195
	pres/rev	7	2	0	0,2258	0,4973
	Rev	53	9	0	1,7097	2,0362
	rev/imp	16	6	0	0,5161	1,2348
	imp	488	43	3	15,7742	10,5789
	imp/pres	4	1	0	0,1290	0,3408
	imp/ant	22	6	0	0,7097	1,6369
	ant	17	6	0	0,5484	1,2339
	preh	10	2	0	0,3226	0,5993

Table A9: Descriptive statistics; see Table A3 for abbreviations.

DATA China 2002 per Region							
Category	**Sub-category**	**Unit**	**Total**	**Max**	**Min**	**Median**	**Standard deviation**
Mountains	*source Yiqilai*		43	5	0	1	1,382689
	source Travel-China-Guide		24	3	0	1	0,920495
	Status		13	2	0	0	0,672022
Sights classifications ('must sees')	*source Travel-China-Guide*	**C**	182	22	0	6	5,457362
		N	71	8	0	2	2,019795
		CN	253	24	1	8	6,372319
	source Yiqilai	**C**	30	4	0	1	1,378015
		N	46	5	0	1	1,338431
		CN	76	6	0	2	1,822795
Tourist Cities	*source Yiqilai*	**ETC**	138	14	0	4	3,731297
		HFC	96	7	0	3	2,314517
		Total TC	189	17	1	6	4,221807
	source CNTA	**TTC**	24	3	0	1	0,844972
		SRTC	68	8	0	2	1,939405
		Total TC	92	10	0	3	2,442456
Regions	*Groups*	**N**	5				
		NE	3				
		E	7				
		S	6				
		SW	5				
		NW	5				
	coast/non-coast	**C**	11				
		NC	20				
Transportation	*civil airports*		148	11	1	5	2,692083
	Railways		72744,4	6192,6	213,9	2347	1438,39
	Highways		1765222	164852	6286	56943	33502,08
Climate	*Temperature*			25	5	15	5,098364
	relative humidity			82	40	64	12,4391
	Precipitation			1865,7	279,7	903	534,7006
Physical conditions	*Area*		9344350	1604712	5994	301431	370965,3
	coast length		14255673				
Population	*population total*		128453	9613	267	4113	2657,265
	population density			2711	2	378	493,6433
	minority population		47	97	10	50	19,78172
Economy	*GDP total*		118020,69	11769,73	161,42	3807	3075,023
	GDP per capita		319916	40646	3153	10320	7878,2
Tourism	*domestic total*		144038	11496	73	4646	3048,115
	domestic revenue			1010	6	322	293,2073
	international total		4039	1526	1	130	270,7418
	international revenue			9942	1	788	2343,218
Natural conditions	*nature reserves number*		1757	191	3	57	48,2358
	nature reserves area		13294.5				
	nature reserves percentage		13				
	pollution accidents		1921	358	1	71	92,12229

Table A10: Summary of regression results: The number of times an explanatory variable is significant at the 5% level (sig).

	Domestic		Foreign	
	# sig	out of	# sig	out of
Airports	0	9	0	9
Railways	1	9	4	9
Highways	8	9	2	9
Area	2	9	4	9
Coast	5	9	0	9
Mountains	0	9	0	9
Cities	9	9	0	9
Spots	0	9	7	9
Sights	9	9	0	9
GDP/capita	9	9	9	9
Population density	9	9	6	9
Humidity	3	3	1	3
Temperature	1	3	3	3
Precipitation	0	3	1	3
Size of natural area	2	3	2	3
Number of nature reserves	1	3	2	3
Share of natural area	0	3	1	3
Latitude	0	3	3	3
Longitude	1	3	0	3
East	0	3	0	3
North	0	3	0	3
Northeast	3	3	0	3
Northwest	0	3	0	3
South	0	3	0	3

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Schwoon, M. (2006), *A Tool to Optimize the Initial Distribution of Hydrogen Filling Stations*, **FNU-110** (*Transportation Research D: Transport and the Environment*, **12** (2), 70-82).

Tol, R.S.J., K.L. Ebi and G.W. Yohe (2006), *Infectious Disease, Development, and Climate Change: A Scenario Analysis*, **FNU-109** (forthcoming, *Environment and Development Economics*).

Lau, M.A. (2006), *An analysis of the travel motivation of tourists from the People's Republic of China*, **FNU-108** (submitted).

Lau, M.A. and R.S.J. Tol (2006), *The Chinese are coming – An analysis of the preferences of Chinese holiday makers at home and abroad*, **FNU-107** (submitted, *Tourism Management*).

Röckmann, C., R.S.J. Tol, U.A. Schneider, and M.A. St.John (2006), *Rebuilding the Eastern Baltic cod stock under environmental change - Part II: The economic viability of a marine protected area.* **FNU-106** (submitted)

Ronneberger, K., M. Berrittella, F. Bosello and R.S.J. Tol (2006), *KLUM@GTAP: Introducing biophysical aspects of land-use decisions into a general equilibrium model. A coupling experiment*, **FNU-105** (submitted).

Link, P.M. and Tol, R.S.J. (2006), *Economic impacts on key Barents Sea fisheries arising from changes in the strength of the Atlantic thermohaline circulation*, **FNU-104** (submitted).

Link, P.M. and Tol, R.S.J. (2006), *The Economic Impact of a Shutdown of the Thermohaline Circulation: An Application of FUND*, **FNU-103** (submitted).

Tol, R.S.J. (2006), *Integrated Assessment Modelling*, **FNU-102** (submitted).

Tol, R.S.J. (2006), *Carbon Dioxide Emission Scenarios for the USA*, **FNU-101** (submitted, *Energy Policy*).

Tol, R.S.J., S.W. Pacala and R.H. Socolow (2006), *Understanding Long-Term Energy Use and Carbon Dioxide Emissions in the USA*, **FNU-100** (submitted).

Sesabo, J.K, H. Lang and R.S.J. Tol (2006), *Perceived Attitude and Marine Protected Areas (MPAs) establishment: Why households' characteristics matters in Coastal resources conservation initiatives in Tanzania*, **FNU-99** (submitted).

Tol, R.S.J. (2006), *The Polluter Pays Principle and Cost-Benefit Analysis of Climate Change: An Application of* FUND, **FNU-98** (submitted, *Environmental and Resource Economics*)

Tol, R.S.J. and G.W. Yohe (2006), *The Weakest Link Hypothesis for Adaptive Capacity: An Empirical Test*, **FNU-97** (forthcoming, *Global Environmental Change*)

Berrittella, M., K. Rehdanz, R.Roson and R.S.J. Tol (2005), *The Economic Impact of Water Pricing: A Computable General Equilibrium Analysis*, **FNU-96** (submitted, *Water Policy*)

Sesabo, J.K. and R. S. J. Tol (2005), *Technical Efficiency and Small-scale Fishing Households in Tanzanian coastal Villages: An Empirical Analysis*, **FNU-95** (submitted)

Lau, M.A. (2005), *Adaptation to Sea-level Rise in the People's Republic of China – Assessing the Institutional Dimension of Alternative Organisational Frameworks*, **FNU-94** (submitted)

Berrittella, M., A.Y. Hoekstra, K. Rehdanz, R. Roson and R.S.J. Tol (2005), *The Economic Impact of Restricted Water Supply: A Computable General Equilibrium Analysis*, **FNU-93** (*Water Research*, **42**, 1799-1813)

Tol, R.S.J. (2005), *Europe's Long Term Climate Target: A Critical Evaluation*, **FNU-92** (*Energy Policy*, **35** (1), 424-434)

Hamilton, J.M. (2005), *Coastal Landscape and the Hedonic Price of Accommodation*, **FNU-91** (submitted)

Hamilton, J.M., D.J. Maddison and R.S.J. Tol (2005), *Climate Preferences and Destination Choice: A Segmentation Approach*, **FNU-90** (submitted)

Zhou, Y. and R.S.J. Tol (2005), *Valuing the Health Impacts from Particulate Air Pollution in Tianjin*, **FNU-89** (submitted)

Röckmann, C. (2005), *International Cooperation for Sustainable Fisheries in the Baltic Sea*, **FNU-88** (forthcoming, in Ehlers,P./Lagoni,R. (Eds.): *International Maritime Organisations and their Contribution towards a Sustainable Marine Development*.)

Ceronsky, M., D. Anthoff, C. Hepburn and R.S.J. Tol (2005), *Checking the price tag on catastrophe: The social cost of carbon under non-linear climate response* **FNU-87** (submitted, *Climatic Change*)

Zandersen, M. and R.S.J. Tol (2005), *A Meta-analysis of Forest Recreation Values in Europe*, **FNU-86** (submitted, *Journal of Environmental Management*)

Heinzow, T., R.S.J. Tol and B. Brümmer (2005), Offshore-Windstromerzeugung in der Nordsee -eine ökonomische und ökologische Sackgasse? **FNU-85** (*Energiewirtschaftliche Tagesfragen*, **56** (3), 68-73)

Röckmann, C., U.A. Schneider, M.A. St.John, and R.S.J. Tol (2005), *Rebuilding the Eastern Baltic cod stock under environmental change - a preliminary approach using stock, environmental, and management constraints*, **FNU-84** (forthcoming, *Natural Resource Modeling*)

Tol, R.S.J. and G.W. Yohe (2005), *Infinite uncertainty, forgotten feedbacks, and cost-benefit analysis of climate policy*, **FNU-83** (submitted, *Climatic Change*)

Osmani, D. and R.S.J. Tol (2005), *The case of two self-enforcing international agreements for environmental protection*, **FNU-82** (submitted)

Schneider, U.A. and B.A. McCarl, (2005), *Appraising Agricultural Greenhouse Gas Mitigation Potentials: Effects of Alternative Assumptions*, **FNU-81** (submitted)

Zandersen, M., M. Termansen, and F.S. Jensen, (2005), *Valuing new forest sites over time: the case of afforestation and recreation in Denmark*, **FNU-80** (submitted)

Guillerminet, M.-L. and R.S.J. Tol (2005), *Decision making under catastrophic risk and learning: the case of the possible collapse of the West Antarctic Ice Sheet*, **FNU-79** (submitted, *Climatic Change*)

Nicholls, R.J., R.S.J. Tol and A.T. Vafeidis (2005), *Global estimates of the impact of a collapse of the West Antarctic Ice Sheet: An application of FUND*, **FNU-78** (submitted, *Climatic Change*)

Lonsdale, K., T.E. Downing, R.J. Nicholls, D. Parker, A.T. Vafeidis, R. Dawson and J.W. Hall (2005), *Plausible responses to the threat of rapid sea-level rise for the Thames Estuary*, **FNU-77** (submitted, *Climatic Change*)

Poumadère, M., C. Mays, G. Pfeifle with A.T. Vafeidis (2005), *Worst Case Scenario and Stakeholder Group Decision: A 5-6 Meter Sea Level Rise in the Rhone Delta, France*, **FNU-76** (submitted, *Climatic Change*)

Olsthoorn, A.A., P.E. van der Werff, L.M. Bouwer and D. Huitema (2005), *Neo-Atlantis: Dutch Responses to Five Meter Sea Level Rise*, **FNU-75** (submitted, *Climatic Change*)

Toth, F.L. and E. Hizsnyik (2005), *Managing the inconceivable: Participatory assessments of impacts and responses to extreme climate change*, **FNU-74** (submitted, *Climatic Change*)

Kasperson, R.E. M.T. Bohn and R. Goble (2005), *Assessing the risks of a future rapid large sea level rise: A review*, **FNU-73** (submitted, *Climatic Change*)

Schleupner, C. (2005), *Evaluation of coastal squeeze and beach reduction and its consequences for the Caribbean island Martinique*, **FNU-72** (submitted)

Schleupner, C. (2005), *Spatial Analysis As Tool for Sensitivity Assessment of Sea Level Rise Impacts on Martinique*, **FNU-71** (submitted)

Sesabo, J.K. and R.S.J. Tol (2005), *Factors affecting Income Strategies among households in Tanzanian Coastal Villages: Implication for Development-Conservation Initiatives*, **FNU-70** (submitted)

Fisher, B.S., G. Jakeman, H.M. Pant, M. Schwoon. and R.S.J. Tol (2005), *CHIMP: A Simple Population Model for Use in Integrated Assessment of Global Environmental Change*, **FNU-69** (*Integrated Assessment Journal*, **6** (3), 1-33)

Rehdanz, K. and R.S.J. Tol (2005), *A No Cap But Trade Proposal for Greenhouse Gas Emission Reduction Targets for Brazil, China and India*, **FNU-68** (submitted, *Climate Policy*)

Zhou, Y. and R.S.J. Tol (2005), *Water Use in China's Domestic, Industrial and Agricultural Sectors: An Empirical Analysis*, **FNU-67** (*Water Science and Technoloy: Water Supply*, **5** (6), 85-93)

Rehdanz, K. (2005), *Determinants of Residential Space Heating Expenditures in Germany*, **FNU-66** (forthcoming, *Energy Economics*)

Ronneberger, K., R.S.J. Tol and U.A. Schneider (2005), *KLUM: A Simple Model of Global Agricultural Land Use as a Coupling Tool of Economy and Vegetation*, **FNU-65** (submitted, *Climatic Change*)

Tol, R.S.J. (2005), *The Benefits of Greenhouse Gas Emission Reduction: An Application of* FUND, **FNU-64** (submitted, *Global Environmental Change*)

Röckmann, C., M.A. St.John, U.A. Schneider, F.W. Köster, F.W. and R.S.J. Tol (2006), *Testing the implications of a permanent or seasonal marine reserve on the population dynamics of Eastern Baltic cod under varying environmental conditions*, **FNU-63-revised** (submitted)

Letsoalo, A., J. Blignaut, T. de Wet, M. de Wit, S. Hess, R.S.J. Tol and J. van Heerden (2005), *Triple Dividends of Water Consumption Charges in South Africa*, **FNU-62** (forthcoming, *Water Resources Research*)

Zandersen, M., Termansen, M., Jensen,F.S. (2005), *Benefit Transfer over Time of Ecosystem Values: the Case of Forest Recreation*, **FNU-61** (submitted)

Rehdanz, K., Jung, M., Tol, R.S.J. and Wetzel, P. (2005), *Ocean Carbon Sinks and International Climate Policy*, **FNU-60** (*Energy Policy*, **34**, 3516-3526)

Schwoon, M. (2005), *Simulating the Adoption of Fuel Cell Vehicles*, **FNU-59** (submitted)

Bigano, A., J.M. Hamilton and R.S.J. Tol (2005), *The Impact of Climate Change on Domestic and International Tourism: A Simulation Study*, **FNU-58** (submitted)

Bosello, F., R. Roson and R.S.J. Tol (2004), *Economy-wide estimates of the implications of climate change: Human health*, **FNU-57** (*Ecological Economics*, **58**, 579-591)

Hamilton, J.M. and M.A. Lau (2004) *The role of climate information in tourist destination choice decision-making*, **FNU-56** (forthcoming, Gössling, S. and C.M. Hall (eds.), Tourism and Global Environmental Change. London: Routledge)

Bigano, A., J.M. Hamilton and R.S.J. Tol (2004), *The impact of climate on holiday destination choice*, **FNU-55** (*Climatic Change*, **76** (3-4), 389-406)

Bigano, A., J.M. Hamilton, M. Lau, R.S.J. Tol and Y. Zhou (2004), *A global database of domestic and international tourist numbers at national and subnational level*, **FNU-54** (forthcoming, *International Journal of Tourism Research*)

Susandi, A. and R.S.J. Tol (2004), *Impact of international emission reduction on energy and forestry sector of Indonesia*, **FNU-53** (submitted)

Hamilton, J.M. and R.S.J. Tol (2004), *The Impact of Climate Change on Tourism and Recreation*, **FNU-52** (forthcoming, Schlesinger et al. (eds.), Cambridge University Press)

Schneider, U.A. (2004), *Land Use Decision Modelling with Soil Status Dependent Emission Rates*, **FNU-51** (submitted)

Link, P.M., U.A. Schneider and R.S.J. Tol (2004), *Economic impacts of changes in fish population dynamics: the role of the fishermen's harvesting strategies*, **FNU-50** (submitted)

Berritella, M., A. Bigano, R. Roson and R.S.J. Tol (2004), *A General Equilibrium Analysis of Climate Change Impacts on Tourism*, **FNU-49** (*Tourism Management*, **27** (5), 913-924)

Tol, R.S.J. (2004), *The Double Trade-Off between Adaptation and Mitigation for Sea Level Rise: An Application of* FUND, **FNU-48** (forthcoming, *Mitigation and Adaptation Strategies for Global Change*)

Erdil, E. and Yetkiner, I.H. (2004), *A Panel Data Approach for Income-Health Causality*, **FNU-47**

Tol, R.S.J. (2004), *Multi-Gas Emission Reduction for Climate Change Policy: An Application of* FUND, **FNU-46** (forthcoming, *Energy Journal*)

Tol, R.S.J. (2004), *Exchange Rates and Climate Change: An Application of* FUND, **FNU-45** (*Climatic Change*, **75**, 59-80)

Gaitan, B., Tol, R.S.J, and Yetkiner, I. Hakan (2004), *The Hotelling's Rule Revisited in a Dynamic General Equilibrium Model*, **FNU-44** (submitted)

Rehdanz, K. and Tol, R.S.J (2004), *On Multi-Period Allocation of Tradable Emission Permits*, **FNU-43** (submitted)

Link, P.M. and Tol, R.S.J. (2004), *Possible Economic Impacts of a Shutdown of the Thermohaline Circulation: An Application of* FUND, **FNU-42** (*Portuguese Economic Journal*, **3**, 99-114)

Zhou, Y. and Tol, R.S.J. (2004), *Evaluating the costs of desalination and water transport*, **FNU-41** (*Water Resources Research*, **41** (3), W03003)

Lau, M. (2004), *Küstenzonenmanagement in der Volksrepublik China und Anpassungsstrategien an den Meeresspiegelanstieg*,**FNU-40** (*Coastline Reports*, Issue 1, pp.213-224.)

Rehdanz, K. and Maddison, D. (2004), *The Amenity Value of Climate to German Households*, **FNU-39** (submitted)

Bosello, F., Lazzarin, M., Roson, R. and Tol, R.S.J. (2004), *Economy-wide Estimates of the Implications of Climate Change: Sea Level Rise*, **FNU-38** (submitted, *Environmental and Resource Economics*)

Schwoon, M. and Tol, R.S.J. (2004), *Optimal CO_2-abatement with socio-economic inertia and induced technological change*, **FNU-37** (submitted, *Energy Journal*)

Hamilton, J.M., Maddison, D.J. and Tol, R.S.J. (2004), *The Effects of Climate Change on International Tourism*, **FNU-36** (*Climate Research*, **29**, 255-268)

Hansen, O. and R.S.J. Tol (2003), *A Refined Inglehart Index of Materialism and Postmaterialism*, **FNU-35** (submitted)

Heinzow, T. and R.S.J. Tol (2003), *Prediction of Crop Yields across four Climate Zones in Germany: An Artificial Neural Network Approach*, **FNU-34** (submitted, *Climate Research*)

Tol, R.S.J. (2003), *Adaptation and Mitigation: Trade-offs in Substance and Methods*, **FNU-33** (*Environmental Science and Policy*, **8** (6), 572-578)

Tol, R.S.J. and T. Heinzow (2003), *Estimates of the External and Sustainability Costs of Climate Change*, **FNU-32** (submitted)

Hamilton, J.M., Maddison, D.J. and Tol, R.S.J. (2003), *Climate change and international tourism: a simulation study*, **FNU-31** (*Global Environmental Change*, **15** (3), 253-266)

Link, P.M. and R.S.J. Tol (2003), *Economic impacts of changes in population dynamics of fish on the fisheries in the Barents Sea*, **FNU-30** (*ICES Journal of Marine Science*, **63** (4), 611-625)

Link, P.M. (2003), *Auswirkungen populationsdynamischer Veränderungen in Fischbeständen auf die Fischereiwirtschaft in der Barentssee*, **FNU-29** (*Essener Geographische Arbeiten*, **35**, 179-202)

Lau, M. (2003), *Coastal Zone Management in the People's Republic of China – An Assessment of Structural Impacts on Decision-making Processes*, **FNU-28** (*Ocean & Coastal Management*, No. 48 (2005), pp. 115-159.)

Lau, M. (2003), *Coastal Zone Management in the People's Republic of China – A Unique Approach?*, **FNU-27** (*China Environment Series*, Issue 6, pp. 120-124; http://www.wilsoncenter.org/topics/pubs/7-commentaries.pdf)

Roson, R. and R.S.J. Tol (2003), *An Integrated Assessment Model of Economy-Energy-Climate – The Model Wiagem: A Comment*, **FNU-26** (*Integrated Assessment*, **6** (1), 75-82)

Yetkiner, I.H. (2003), *Is There An Indispensable Role For Government During Recovery From An Earthquake? A Theoretical Elaboration*, **FNU-25**

Yetkiner, I.H. (2003), *A Short Note On The Solution Procedure Of Barro And Sala-i-Martin for Restoring Constancy Conditions*, **FNU-24**

Schneider, U.A. and B.A. McCarl (2003), *Measuring Abatement Potentials When Multiple Change is Present: The Case of Greenhouse Gas Mitigation in U.S. Agriculture and Forestry*, **FNU-23** (submitted)

Zhou, Y. and Tol, R.S.J. (2003), *The Implications of Desalination to Water Resources in China - an Economic Perspective*, **FNU-22** (*Desalination*, **163** (4), 225-240)

Yetkiner, I.H., de Vaal, A., and van Zon, A. (2003), *The Cyclical Advancement of Drastic Technologies*, **FNU-21**

Rehdanz, K. and Maddison, D. (2003) *Climate and Happiness*, **FNU-20** (*Ecological Economics*, **52** 111-125)

Tol, R.S.J., (2003), *The Marginal Costs of Carbon Dioxide Emissions: An Assessment of the Uncertainties*, **FNU-19** (*Energy Policy*, **33** (16), 2064-2074).

Lee, H.C., B.A. McCarl, U.A. Schneider, and C.C. Chen (2003), *Leakage and Comparative Advantage Implications of Agricultural Participation in Greenhouse Gas Emission Mitigation*, **FNU-18** (submitted).

Schneider, U.A. and B.A. McCarl (2003), *Implications of a Carbon Based Energy Tax for U.S. Agriculture*, **FNU-17** (submitted).

Tol, R.S.J. (2002), *Climate, Development, and Malaria: An Application of* FUND, **FNU-16** (forthcoming, *Climatic Change*).

Hamilton, J.M. (2003), *Climate and the Destination Choice of German Tourists*, **FNU-15** (revised and submitted).

Tol, R.S.J. (2002), *Technology Protocols for Climate Change: An Application of* FUND, **FNU-14** (*Climate Policy*, **4**, 269-287).

Rehdanz, K (2002), *Hedonic Pricing of Climate Change Impacts to Households in Great Britain*, **FNU-13** (forthcoming, *Climatic Change*).

Tol, R.S.J. (2002), *Emission Abatement Versus Development As Strategies To Reduce Vulnerability To Climate Change: An Application Of* FUND, **FNU-12** (forthcoming, *Environment and Development Economics*).

Rehdanz, K. and Tol, R.S.J. (2002), *On National and International Trade in Greenhouse Gas Emission Permits*, **FNU-11** (*Ecological Economics*, **54**, 397-416).

Fankhauser, S. and Tol, R.S.J. (2001), *On Climate Change and Growth*, **FNU-10** (*Resource and Energy Economics*, **27**, 1-17).

Tol, R.S.J.and Verheyen, R. (2001), *Liability and Compensation for Climate Change Damages – A Legal and Economic Assessment*, **FNU-9** (*Energy Policy*, **32** (9), 1109-1130).

Yohe, G. and R.S.J. Tol (2001), *Indicators for Social and Economic Coping Capacity – Moving Toward a Working Definition of Adaptive Capacity*, **FNU-8** (*Global Environmental Change*, **12** (1), 25-40).

Kemfert, C., W. Lise and R.S.J. Tol (2001), *Games of Climate Change with International Trade*, **FNU-7** (*Environmental and Resource Economics*, **28**, 209-232).

Tol, R.S.J., W. Lise, B. Morel and B.C.C. van der Zwaan (2001), *Technology Development and Diffusion and Incentives to Abate Greenhouse Gas Emissions*, **FNU-6** (submitted).

Kemfert, C. and R.S.J. Tol (2001), *Equity, International Trade and Climate Policy*, **FNU-5** (*International Environmental Agreements*, **2**, 23-48).

Tol, R.S.J., Downing T.E., Fankhauser S., Richels R.G. and Smith J.B. (2001), *Progress in Estimating the Marginal Costs of Greenhouse Gas Emissions*, **FNU-4**. (*Pollution Atmosphérique – Numéro Spécial: Combien Vaut l'Air Propre?*, 155-179).

Tol, R.S.J. (2000), *How Large is the Uncertainty about Climate Change?*, **FNU-3** (*Climatic Change*, **56** (3), 265-289).

Tol, R.S.J., S. Fankhauser, R.G. Richels and J.B. Smith (2000), *How Much Damage Will Climate Change Do? Recent Estimates*, **FNU-2** (*World Economics*, **1** (4), 179-206)

Lise, W. and R.S.J. Tol (2000), *Impact of Climate on Tourism Demand*, **FNU-1** (*Climatic Change*, **55** (4), 429-449).

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